vacon

DRIVEN BY DRIVES


# USER'S MANUAL

## NX FREQUENCY CONVERTERS

## 3-SPEED POSITIONING APPLICATION

### APFIFF15

# INDEX

Synchronize positioning

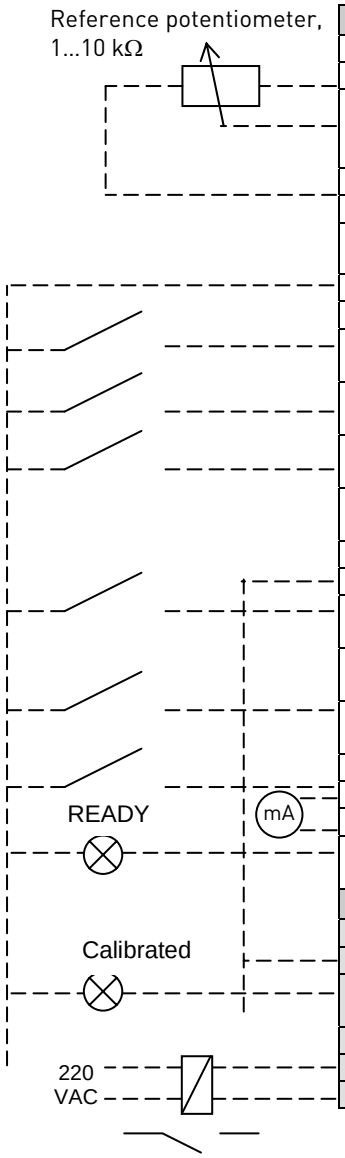
## 1. Introduction

Frequency converter works as a positioning controller with the help of encoder. Encoder should be installed on motor shaft but also it's possible to use encoder after gear. When encoder is in motor shaft it's possible to use closed loop motor control. This makes positioning more accurate. Application support also System Bus communication this communication makes possible to synchronization with two drives. Master drive sends it's actual position to Follower drive and follower correct it's speed reference to stay in position window if follower drive fails to stay in window follower sends stop request to master an both drive stops at the same time with minimum position difference.

Additional functions:

- Programmable Start/Stop and Reverse signal logic
- Reference scaling
- One frequency limit supervision
- Second ramps and S-shape ramp programming
- Programmable start and stop functions
- DC-brake at stop
- One prohibit frequency area
- Programmable U/f curve and switching frequency
- Auto restart
- Motor thermal and stall protection: Programmable action; off, warning, fault
- Automatic encoder recognition (Incremental/Absolute)
- Auto stop when calibrated

## 2. Control I/O

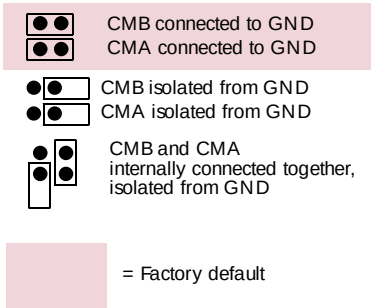



| NXOPTA1 | | | |
|---|---|---|---|
| Terminal | | Signal | Description |
| 1 | +10V$_{ref}$ | Reference output | Voltage for potentiometer, etc. |
| 2 | AI1+ | Analogue input, voltage range 0—10V DC | Voltage input frequency reference |
| 3 | AI1- | I/O Ground | Ground for reference and controls |
| 4 | AI2+ | Analogue input, current range 0—20mA | Current input frequency reference |
| 5 | AI2- | | |
| 6 | +24V | Control voltage output | Voltage for switches, etc. max 0.1 A |
| 7 | GND | I/O ground | Ground for reference and controls |
| 8 | DIN1 | Start forward (programmable) | Contact closed = start forward |
| 9 | DIN2 | Start reverse (programmable) | Contact closed = start reverse |
| 10 | DIN3 | Preset Speed (programmable) | Contact open = Not Activ<br>Contact closed = Preset speed activ |
| 11 | CMA | Common for DIN 1—DIN 3 | Connect to GND or +24V |
| 12 | +24V | Control voltage output | Voltage for switches (see #6) |
| 13 | GND | I/O ground | Ground for reference and controls |
| 14 | DIN4 | Reset calibration (programmable) | |
| 15 | DIN5 | Active positioning (programmable) | |
| 16 | DIN6 | Calibration input (programmable) | Raising edge calibration |
| 17 | CMB | Common for DIN4—DIN6 | Connect to GND or +24V |
| 18 | AO1+ | Output frequency | Programmable |
| 19 | AO1- | Analogue output | Range 0—20 mA/$R_L$, max. 500Ω |
| 20 | DO1 | Digital output<br>READY | Programmable<br>Open collector, I≤50mA, U≤48 VDC |
| **NXOPTA2** | | | |
| 21 | RO1 | Relay output 1<br>Calibration OK | Programmable |
| 22 | RO1 | | |
| 23 | RO1 | | |
| 24 | RO2 | Relay output 2<br>FAULT | Programmable |
| 25 | RO2 | | |
| 26 | RO2 | | |

*Table 2-1. Synchronize Positioning application default I/O configuration.*

**Note:** See jumper selections below. More information in the product's User's Manual.

**Jumper block X3:**
**CMA and CMB grounding**



## 3. Control signal logic in Synchronize Positioning Application

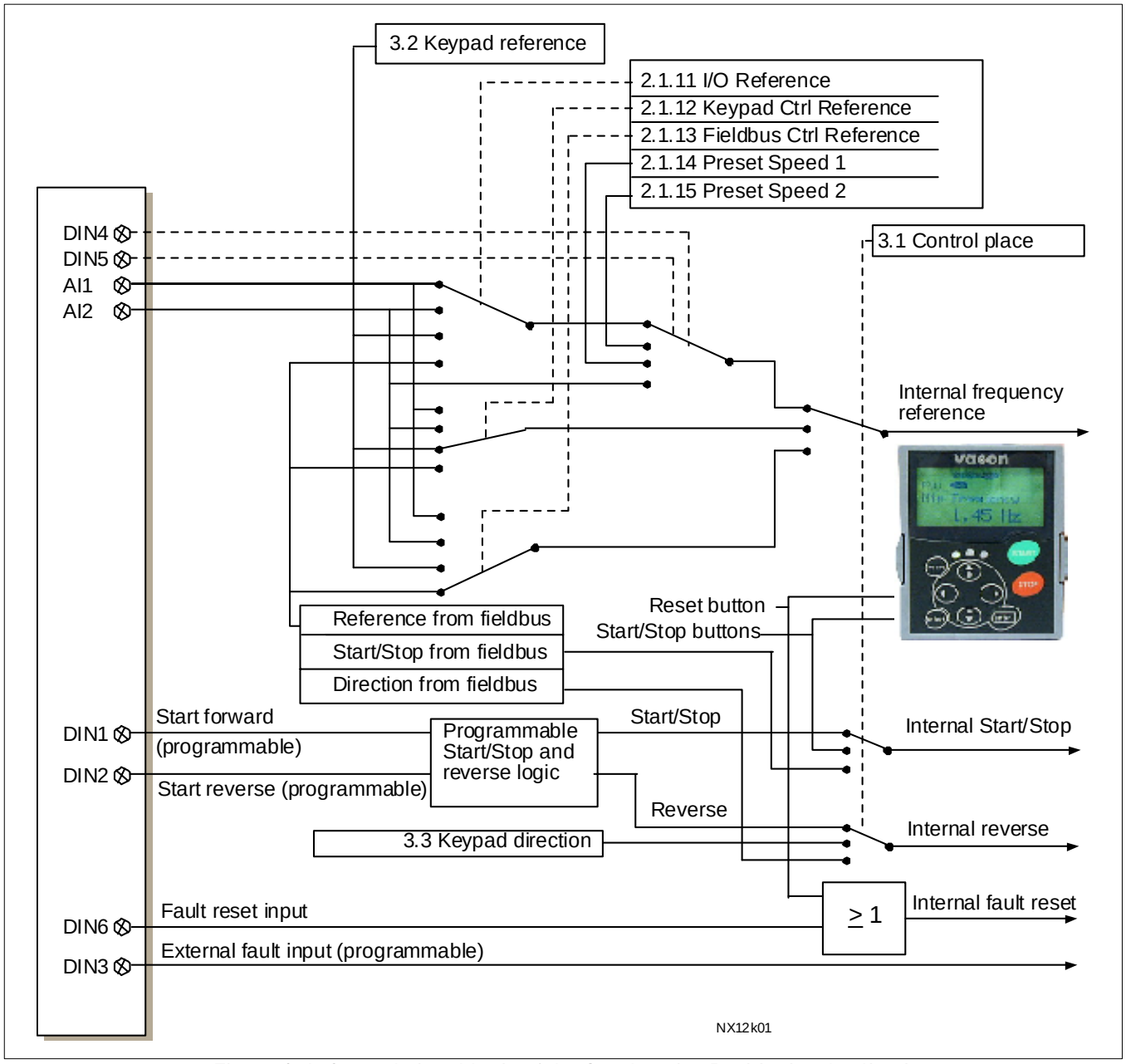



*Figure 3-1. Control signal logic of the Synchronize Positioning Application*

## 4. Positioning sequence

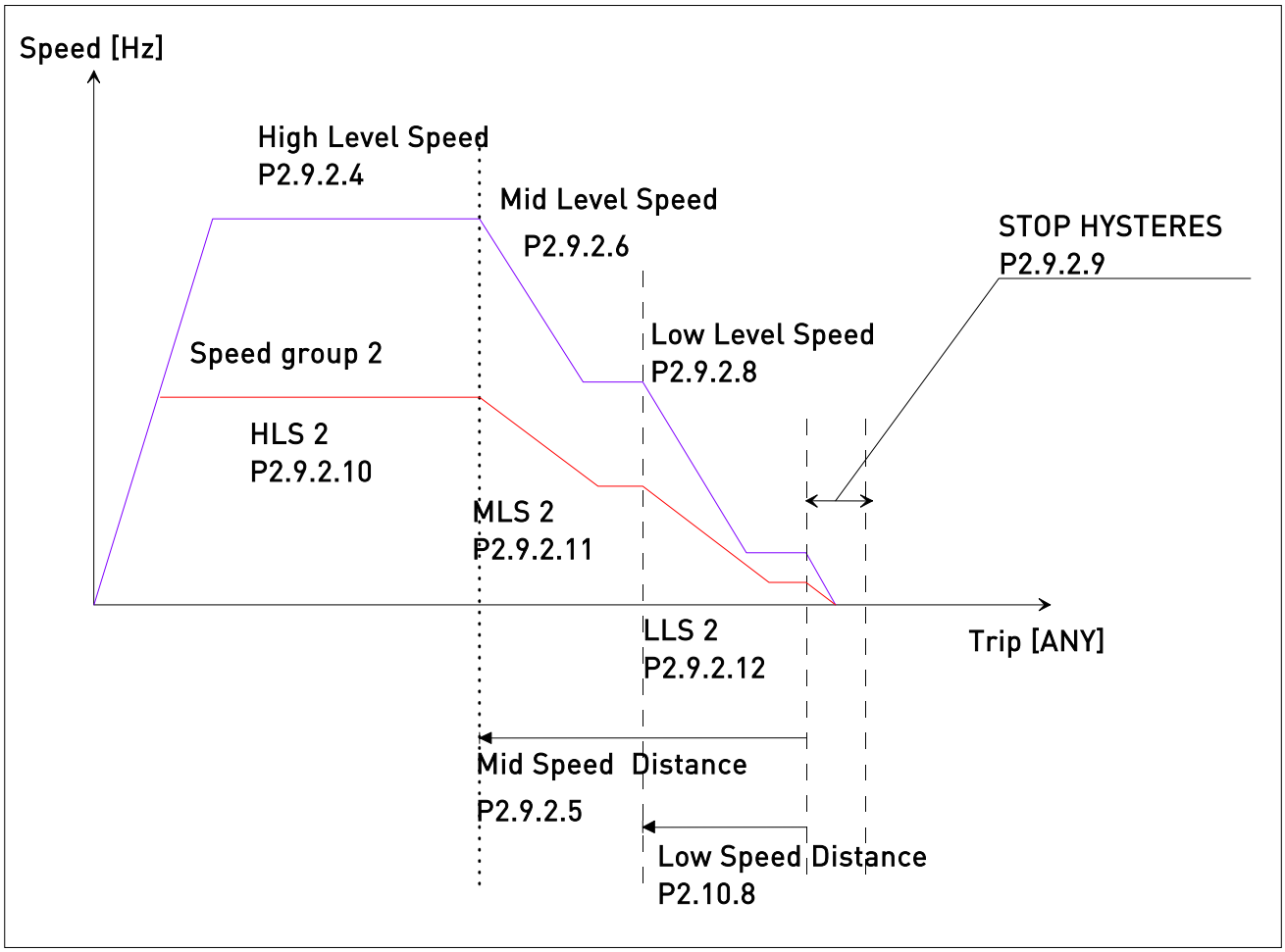



*Figure 4-1. Positioning sequence of the Synchronize Positioning Application*

Positioning uses three different speed. When approaching the target, speed is decelerated with three different phases. There are also two different speed groups, for example positioning with or without the load.

## 5. Synchronize Positioning Application – Parameter lists

On the next pages you will find the lists of parameters within the respective parameter groups. The parameter descriptions are given on pages 25 to 34. The descriptions are arranged according to the **ID number** of the parameter.

**Column explanations:**

Code = Location indication on the keypad; Shows the operator the present parameter number
Parameter = Name of parameter
Min = Minimum value of parameter
Max = Maximum value of parameter
Unit = Unit of parameter value; Given if available
Default = Value preset by factory
Cust = Customer's own setting
ID = ID number of the parameter
= In parameter row: Use TTF method to program these parameters.
= On parameter code: Parameter value can only be changed after the frequency converter has been stopped.

### 5.1 Monitoring values (Control keypad: menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited.
See the product's User's Manual for more information.

| Code | Parameter | Unit | ID | Description |
|---|---|---|---|---|
| V1.1.1 | Output frequency | Hz | 1 | Output frequency to motor |
| V1.1.2 | Frequency reference | Hz | 25 | Frequency reference to motor control |
| V1.1.3 | Motor speed | rpm | 2 | Motor speed in rpm |
| V1.1.4 | Motor current | A | 3 | |
| V1.1.5 | Motor torque | % | 4 | In % of the nominal motor torque |
| V1.1.6 | Motor power | % | 5 | Motor shaft power |
| V1.1.7 | Motor voltage | V | 6 | |
| V1.1.8 | DC link voltage | V | 7 | |
| V1.1.9 | Unit temperature | °C | 8 | Heatsink temperature |
| V1.1.10 | Motor temperature | % | 9 | Calculated motor temperature |
| V1.1.11 | Analogue input 1 | V | 13 | AI1 |
| V1.1.12 | Analogue input 2 | mA | 14 | AI2 |
| V1.1.13 | DIN1, DIN2, DIN3 | | 15 | Digital input statuses |
| V1.1.14 | DIN4, DIN5, DIN6 | | 16 | Digital input statuses |
| V1.1.15 | DO1, RO1, RO2 | | 17 | Digital and relay output statuses |
| V1.1.16 | Analogue $I_{out}$ | mA | 26 | AO1 |
| M1.17 | Monitoring items | | | Displays three selectable monitoring values |

*Table 5-1. Basic monitoring values*

| Code | Parameter | Unit | ID | Description |
|---|---|---|---|---|
| V1.2.1 | Actual Position | | 1551 | Actual position in user units |
| V1.2.2 | Target Position | | 1553 | Target position in user units |
| V1.2.3 | Master Position | | 1623 | Received by follower |
| V1.2.4 | Position error | | 1625 | Error of master and follower |
| V1.2.5 | ENC Revolution | | 1580 | Rounds of incremental |
| V1.2.6 | ENC Fragment | | 1581 | Fragments of incremental |
| V1.2.7 | ABS Revolution | | 1629 | Absolute encoder |
| V1.2.8 | ABS Fragments | | 1630 | Absolute encoder |
| V1.2.9 | Scaled ABS Position | | 1632 | Scaled value for incremental monitor |

*Table 5-2. Position monitoring values*

| Code | Parameter | Unit | ID | Description |
|---|---|---|---|---|
| V1.3.1 | FB Position Control Word | | 1700 | Position Control Word (PCW) from fielbus |
| V1.3.2 | FB Position Status Word | | 1701 | Position Status Word (PSW) to fielbus |
| V1.3.3 | FB Position Reference | | 1730 | Position reference from fielbus |
| V1.3.4 | FB Target Position | | 1633 | Monitored reference with additional offset |
| V1.3.5 | FB Actual Position | | 1634 | Monitored actual position with additional offset |
| V1.3.6 | FB Maximum Speed | | 1721 | Adjust positioning maximum speed from fielbus |
| V1.3.7 | FB General Status Word | | 1750 | Additional positioning status word to fielbus. |

*Table 5-3. Fielbus monitoring values*

Values that can be used as commands from fielbus are market as grey

| Code | Parameter | Unit | ID | Description |
|---|---|---|---|---|
| V1.4.1 | Current | A | 1113 | Unfiltered current for MonBus |
| V1.4.2 | Torque | % | 1081 | Unfiltered toque for MonBus |
| V1.4.3 | DC Voltage | V | 1082 | Unfiltered DC-Voltage for MonBus |
| V1.4.4 | Status Word | | 1702 | Application Status Word (ASW) |
| V1.4.5 | Frequency Ramp Out | | 1129 | Output of ramp generator |
| V1.4.6 | Encoder 1 Frequency | | 1615 | |

*Table 5-4. MonBus monitoring values*

## 5.2 Control/Status Words

### *5.2.1 Positioning Control Word (PCW)*

| | FALSE | TRUE | Comments |
|---|---|---|---|
| b0 | | FB Calibration | Calibration input from FB |
| b1 | | FB Positioning mode ON | Positioning Command from Fielbus |
| b2 | | FB Speed Group 2 | |
| b3 | | | |
| b4 | | | |
| b5 | | FB Reset Calibration | Command for reseting calibration. |
| b6 | | Calibration Prohibited | Any of calibration input are ignored |
| b7 | | Set Zero Point ABS | Set Zero point for ABS Enc. |
| b8 | | Set Total Rounds ABS | Set Total rounds for ABS Enc. |
| b9 | | Set Target Offset point | Sets offset for reference position |
| b10 | | ByPass SyncError | Fynchronization fault is ignoreg |
| b11 | | | |
| b12 | | | |
| b13 | | | |
| b14 | | | |
| b15 | | | |

*Table 5-5. Positioning Control Word*

### *5.2.2 Positioning Status Word (PSW)*

| | FALSE | TRUE | Comments |
|---|---|---|---|
| b0 | | Calibrated | |
| b1 | | Position Reached | |
| b2 | | Positioning Maximum Speed | |
| b3 | | FB Low area & Position Reached | |
| b4 | | FB High area & Position Reached | |
| b5 | | Master Follower Mode ON | |
| b6 | | | |
| b7 | | | |
| b8 | | Poitionin mode active | |
| b9 | | Calibration Input | |
| b10 | | Synchronizing Error | |
| b11 | | Warning Low End | |
| b12 | | Warning High End | |
| b13 | | Out Of Area | Make new calibration |
| b14 | | Run Enable Low End | |
| b15 | | Run Enable High End | |

*Table 5-6. Positioning Status Word*

### 5.2.3 *FBGeneralStatusWord*

| | FALSE | TRUE | Comments |
|---|---|---|---|
| b0 | Not Reasy | Ready | |
| b1 | Stop | Run | |
| b2 | | | |
| b3 | No Fault | Fault | |
| b4 | No Warning | Warning | |
| b5 | | Calibrated | |
| b6 | | Position reached | |
| b7 | | | |
| b8 | | Positioning ON | |
| b9 | | | |
| b10 | | Synchronize error | |
| b11 | | | |
| b12 | | | |
| b13 | | Out of Area | |
| b14 | | | |
| b15 | | | |

*Table 5-7. FBGeneralStatusWord*

## 5.3 Basic parameters (Control keypad: Menu M2 → G2.1)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.1.1 | Min frequency | 0,00 | Par. 2.1.2 | Hz | 0,00 | | 101 | |
| P2.1.2 | Max frequency | Par. 2.1.1 | 320,00 | Hz | 50,00 | | 102 | **NOTE**: If $f_{max}$ > than the motor synchronous speed, check suitability for motor and drive system |
| P2.1.3 | Acceleration time 1 | 0,01 | 300,00 | s | 3,00 | | 103 | |
| P2.1.4 | Deceleration time 1 | 0,01 | 300,00 | s | 3,00 | | 104 | |
| P2.1.5 | Current limit | 0,0 | 2 x $I_H$ | A | $I_L$ | | 107 | |
| P2.1.6 | Nominal voltage of the motor | 180 | 690 | V | NX2: 230V<br>NX5: 400V<br>NX6: 690V | | 110 | |
| P2.1.7 | Nominal frequency of the motor | 8,00 | 320,00 | Hz | 50,00 | | 111 | Check the rating plate of the motor |
| P2.1.8 | Nominal speed of the motor | 24 | 20 000 | rpm | 1440 | | 112 | The default applies for a 4-pole motor and a nominal size frequency converter. |
| P2.1.9 | Nominal current of the motor | 0,2 x $I_H$ | 2 x $I_H$ | A | $I_H$ | | 113 | Check the rating plate of the motor. |
| 2.1.10 | Motor cosφ | 0,30 | 1,00 | | 0,85 | | 120 | Check the rating plate of the motor |
| 2.1.11 | I/O reference | 0 | 3 | | 0 | | 117 | **0**=AI1<br>**1**=AI2<br>**2**=Keypad<br>**3**=Fieldbus |
| 2.1.12 | Keypad control reference | 0 | 3 | | 2 | | 121 | **0**=AI1<br>**1**=AI2<br>**2**=Keypad<br>**3**=Fieldbus |
| 2.1.13 | Fieldbus control reference | 0 | 3 | | 3 | | 122 | **0**=AI1<br>**1**=AI2<br>**2**=Keypad<br>**3**=Fieldbus |
| 2.1.14 | Position Reference Selector | 0 | 3 | | 2 | | 1548 | **0**=Din Sel. Position Ref.<br>**1**=AI Position Ref.<br>**2**=FB Position Ref.<br>**3**=Master Position Ref. |
| 2.1.15 | Preset speed 1 | 0,00 | Par. 2.1.2 | Hz | 10,00 | | 105 | Speeds preset by operator |

*Table 5-8. Basic parameters G2.1*

## 5.4 Input signals (Control keypad: Menu M2 → G2.2)

### *5.4.1 Basic Settings (Control keypad: Menu M2 → G2.2.1)*

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 300 | | DIN1 | DIN2 |
| P2.2.1.1 | Start/Stop logic | 0 | 6 | | 0 | | | **0** | Start fwd | Start rvs |
| | | | | | | | | **1** | Start/Stop | Rvs/Fwd |
| | | | | | | | | **2** | Start/Stop | Run enable |
| | | | | | | | | **3** | Start pulse | Stop pulse |
| | | | | | | | | **4** | Fwd* | Rvs* |
| | | | | | | | | **5** | Start*/Stop | Rvs/Fwd |
| | | | | | | | | **6** | Start*/Stop | Run enable |
| P2.2.1.2 | Current reference offset | 0 | 1 | | 1 | | 302 | **0**=0—20mA<br>**1**=4—20mA | | |
| P2.2.1.3 | Reference scaling minimum value | 0,00 | par. 2.2.5 | Hz | 0,00 | | 303 | Selects the frequency that corresponds to the min. reference signal<br>0,00 = No scaling | | |
| P2.2.1.4 | Reference scaling maximum value | 0,00 | 320,00 | Hz | 0,00 | | 304 | Selects the frequency that corresponds to the max. reference signal<br>0,00 = No scaling | | |
| P2.2.1.5 | Reference inversion | 0 | 1 | | 0 | | 305 | **0** = Not inverted<br>**1** = Inverted | | |
| P2.2.1.6 | Reference filter time | 0,00 | 10,00 | s | 0,10 | | 306 | **0** = No filtering | | |
| P2.2.1.7 | Position AI Sel | 0.0 | E.10 | | A.2 | | 1549 | TTF programming method used. | | |

*Table 5-9. Input signals, G2.2*

* = Rising edge required to start

### 5.4.2 *Digital inputs (Control keypad: Menu M2 → G2.2.4)*

| Code | Parameter | Min | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|
| P2.2.2.1 | Run enable | 0 | 0.1 | | 407 | Motor start enabled (cc) |
| P2.2.2.2 | Reverse | 0 | 0.1 | | 412 | Direction forward (oc)<br>Direction reverse (cc) |
| P2.2.2.3 | Preset speed 1 | 0 | A.3 | | 419 | |
| P2.2.3.4 | Fault reset | 0 | A.1 | | 414 | All faults reset (cc) |
| P2.2.2.5 | External fault (close) | 0 | 0.1 | | 405 | Ext. fault displayed (cc) |
| P2.2.2.6 | External fault (open) | 0 | 0.2 | | 406 | Ext. fault displayed (oc) |
| P2.2.2.7 | Acc/Dec time selection | 0 | A.6 | | 408 | Acc/Dec time 1 (oc)<br>Acc/Dec time 2 (cc) |
| P2.2.2.8 | Control from I/O terminal | 0 | 0.1 | | 409 | Force control place to I/O terminal (cc) |
| P2.2.2.9 | Control from keypad | 0 | 0.1 | | 410 | Force control place to keypad (cc) |
| P2.2.2.10 | Control from fieldbus | 0 | 0.1 | | 411 | Force control place to fieldbus (cc) |
| P2.2.2.11 | Positioning mode ON | 0 | A.5 | | 1564 | |
| P2.2.2.12 | Calibration | 0 | A.6 | | 1566 | |
| P2.2.2.13 | Select DIN Pos b0 | 0 | 0.1 | | 1567 | |
| P2.2.2.14 | Select DIN Pos b1 | 0 | 0.1 | | 1568 | |
| P2.2.2.15 | Select DIN Pos b2 | 0 | 0.1 | | 1569 | |
| P2.2.2.16 | Select DIN Pos b3 | 0 | 0.1 | | 1570 | |
| P2.2.2.17 | Select DIN Pos b4 | 0 | 0.1 | | 1571 | |
| P2.2.2.18 | External brake enable | 0 | 0.1 | | 1605 | Allows brake open command |
| P2.2.2.19 | Run Enable Low End | 0 | 0.1 | | 1609 | |
| P2.2.2.20 | Run Enable High End | 0 | 0.1 | | 1608 | |
| P2.2.2.21 | Reset Calibration | 0 | A.4 | | 1611 | |
| P2.2.2.22 | Calibration Negative | 0 | 0.1 | | 1612 | |
| P2.2.2.23 | Calibration Signal Prohibited | 0 | 0.1 | | 1613 | |
| P2.2.2.24 | Positioning Speed Group 2 | 0 | 0.1 | | 1563 | |

*Table 5-10. Digital input signals, G2.2.4*

cc = closing contact
oc = opening contact

### 5.4.3 *Maximum Speed Scaling (Menu M2 → G2.2.3)*

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.2.3.1 | High level speed scaling input | 0 | 3 | | 0 | | 1579 | **0**=Not Used<br>**1**=AI1<br>**2**=AI2<br>**3**=Fielbus |
| P2.2.3.2 | High level speed 1 minimum | 0.00 | P2.2.3.3 | % | 0.00 | | 1582 | Positioning speed group 1 scaling minimum value |
| P2.2.3.3 | High level speed 1 maximum | P2.2.3.2 | 200.00 | % | 100.00 | | 1584 | Positioning speed group 1 scaling maximum value |
| P2.2.3.4 | High level speed 2 minimum | 0.00 | P2.2.3.5 | % | 0.00 | | 1583 | Positioning speed group 2 scaling minimum value |
| P2.2.3.5 | High level speed 2 maximum | P2.2.3.4 | 200.00 | % | 100.00 | | 1585 | Positioning speed group 2 scaling maximum value |

*Table 5-11. Input signals, G2.2*

* = Rising edge required to start

## 5.5 Output signals (Control keypad: Menu M2 → G2.3)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.3.1 | Analogue output function | 0 | 8 | | 1 | | 307 | **0**=Not used<br>**1**=Output freq. (0—$f_{max}$)<br>**2**=Freq. reference (0—$f_{max}$)<br>**3**=Motor speed (0—Motor nominal speed)<br>**4**=Motor current (0—$I_{nMotor}$)<br>**5**=Motor torque (0—$T_{nMotor}$)<br>**6**=Motor power (0—$P_{nMotor}$)<br>**7**=Motor voltage (0--$U_{nMotor}$)<br>**8**=DC-link volt (0—1000V)<br>**9**=Ref position<br>**10**=Actual position |
| P2.3.2 | Analogue output filter time | 0,00 | 10,00 | s | 1,00 | | 308 | **0**=No filtering |
| P2.3.3 | Analogue output inversion | 0 | 1 | | 0 | | 309 | **0** = Not inverted<br>**1** = Inverted |
| P2.3.4 | Analogue output minimum | 0 | 1 | | 0 | | 310 | **0** = 0 mA<br>**1** = 4 mA |
| P2.3.5 | Analogue output scale | 10 | 1000 | % | 100 | | 311 | |
| P2.3.6 | Digital output 1 function | 0 | 16 | | 1 | | 312 | **0**=Not used<br>**1**=Ready<br>**2**=Run<br>**3**=Fault<br>**4**=Fault inverted<br>**5**=FC overheat warning<br>**6**=Ext. fault or warning<br>**7**=Ref. fault or warning<br>**8**=Warning<br>**9**=Reversed<br>**10**=Preset speed 1<br>**11**=At speed<br>**12**=Mot. regulator active<br>**13**=OP freq. limit 1 superv.<br>**14**=Control place: IO<br>**15**=Thermistor fault/warng<br>**16**=Fieldbus input data<br>**17**=Calibration OK<br>**18**=Position reached<br>**19**=High Level Speed<br>**20**=Mid Level Speed<br>**21**=Low Level Speed<br>**22**=Out of Area<br>**23**=Forbidden Area<br>**24**=Brake Off Control |
| P2.3.7 | Relay output 1 function | 0 | 16 | | 2 | | 313 | As parameter 2.3.6 |
| P2.3.8 | Relay output 2 function | 0 | 16 | | 3 | | 314 | As parameter 2.3.6 |
| P2.3.9 | Output frequency limit 1 supervision | 0 | 2 | | 0 | | 315 | **0**=No limit<br>**1**=Low limit supervision<br>**2**=High limit supervision |
| P2.3.10 | Output frequency limit 1; Supervised value | 0,00 | 320,00 | Hz | 0,00 | | 316 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P2.3.11 | Analogue output 2 signal selection | 0 | | | 0.1 | | 471 | TTF programming method used. |
| P2.3.12 | Analogue output 2 function | 0 | 8 | | 4 | | 472 | As parameter 2.3.1 |
| P2.3.13 | Analogue output 2 filter time | 0,00 | 10,00 | s | 1,00 | | 473 | **0**=No filtering |
| P2.3.14 | Analogue output 2 inversion | 0 | 1 | | 0 | | 474 | **0**=Not inverted<br>**1**=Inverted |
| P2.3.15 | Analogue output 2 minimum | 0 | 1 | | 0 | | 475 | **0**=0 mA<br>**1**=4 mA |
| P2.3.16 | Analogue output 2 scaling | 10 | 1000 | % | 100 | | 476 | |

*Table 5-12. Output signals, G2.3*

## 5.6 Drive control parameters (Control keypad: Menu M2 → G2.4)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.4.1 | Ramp 1 shape | 0,0 | 10,0 | s | 0,0 | | 500 | **0** = Linear<br>**>0** = S-curve ramp time |
| P2.4.2 | Ramp 2 shape | 0,0 | 10,0 | s | 0,0 | | 501 | **0** = Linear<br>**>0** = S-curve ramp time |
| P2.4.3 | Acceleration time 2 | 0,1 | 3000,0 | s | 10,0 | | 502 | |
| P2.4.4 | Deceleration time 2 | 0,1 | 3000,0 | s | 10,0 | | 503 | |
| P2.4.5 | Brake chopper | 0 | 4 | | 0 | | 504 | **0**=Disabled<br>**1**=Used when running<br>**2**=External brake chopper<br>**3**=Used when stopped/running<br>**4**=Used when running (no testing) |
| P2.4.6 | Start function | 0 | 1 | | 0 | | 505 | **0**=Ramp<br>**1**=Flying start |
| P2.4.7 | Stop function | 0 | 3 | | 0 | | 506 | **0**=Coasting<br>**1**=Ramp<br>**2**=Ramp+Run enable coast<br>**3**=Coast+Run enable ramp |
| P2.4.8 | DC braking current | 0,4 x $I_H$ | 2 x $I_H$ | A | $I_H$ | | 507 | |
| P2.4.9 | DC braking time at stop | 0,00 | 30,000 | s | 0,000 | | 508 | **0** = DC brake is off at stop |
| P2.4.10 | Frequency to start DC braking during ramp stop | 0,10 | 10,00 | Hz | 1,50 | | 515 | |
| P2.4.11 | DC braking time at start | 0,00 | 30,000 | s | 0,000 | | 516 | **0** = DC brake is off at start |
| P2.4.12 | Flux brake | 0 | 1 | | 0 | | 520 | **0** = Off<br>**1** = On |
| P2.4.13 | Flux braking current | 0,4 x $I_H$ | 2 x $I_H$ | A | $I_H$ | | 519 | |
| P2.4.14 | Automatic ramp scaling | 0 | 1 | | 1 | | 1572 | |
| P2.4.15 | Ramp Scale Frequency | 0,00 | 320,00 | Hz | 50,00 | | 1614 | |

*Table 5-13. Drive control parameters, G2.4*

## 5.7 Reserved

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.5.x | Reserved | 0 | 0 | | 0 | | | |

*Table 5-14. Reserved parameters, G2.5*

## 5.8 Motor control parameters (Control keypad: Menu M2 → G2.6)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.6.1 | Motor control mode | 0 | 1/3 | | 0 | | 600 | **NXS:**<br>**0**=Frequency control<br>**1**=Speed control<br>**Additionally for NXP:**<br>**2**=Torque control<br>**3**=Closed loop speed ctrl |
| P2.6.2 | U/f optimisation | 0 | 1 | | 0 | | 109 | **0**=Not used<br>**1**=Automatic torque boost |
| P2.6.3 | U/f ratio selection | 0 | 3 | | 0 | | 108 | **0**=Linear<br>**1**=Squared<br>**2**=Programmable<br>**3**=Linear with flux optim. |
| P2.6.4 | Field weakening point | 8,00 | 320,00 | Hz | 50,00 | | 602 | |
| P2.6.5 | Voltage at field weakening point | 10,00 | 200,00 | % | 100,00 | | 603 | n% x $U_{nmot}$ |
| P2.6.6 | U/f curve midpoint frequency | 0,00 | par. P2.6.4 | Hz | 50,00 | | 604 | |
| P2.6.7 | U/f curve midpoint voltage | 0,00 | 100,00 | % | 100,00 | | 605 | n% x $U_{nmot}$<br>Parameter max. value = par. 2.6.5 |
| P2.6.8 | Output voltage at zero frequency | 0,00 | 40,00 | % | Varies | | 606 | n% x $U_{nmot}$ |
| P2.6.9 | Switching frequency | 1,0 | Varies | kHz | Varies | | 601 | See **Error! Reference source not found.** for exact values |
| P2.6.10 | Overvoltage controller | 0 | 2 | | 0 | | 607 | **0**=Not used<br>**1**=Used (no ramping)<br>**2**=Used (ramping) |
| P2.6.11 | Undervoltage controller | 0 | 1 | | 0 | | 608 | **0**=Not used<br>**1**=Used |
| P2.6.12 | Load drooping | 0,00 | 100,00 | % | 0,00 | | 620 | |
| P2.6.13 | Torque Limit | 0,0 | 300,0 | % | 100,0 | | 609 | |
| P2.6.14 | Identification | 0 | 1/2 | | 0 | | 631 | **0**=No Action/Ready<br>**1**=ID W/O Run<br>**2**=ID Run (NXP) |
| | | | | | | | | |
| P2.6.15.1 | Magnetizing current | 0,00 | 100,00 | A | 0,00 | | 612 | |
| P2.6.15.2 | Speed control P gain | 0 | 1000 | | 30 | | 613 | |
| P2.6.15.3 | Speed control I time | 0,0 | 500,0 | ms | 30,0 | | 614 | |
| P2.6.15.4 | Acceleration compensation | 0,00 | 300,00 | s | 0,00 | | 626 | |
| P2.6.15.5 | Slip adjust | 0 | 500 | % | 100 | | 619 | |
| P2.6.15.6 | Magnetizing current at start | MotCurr Min | MotCurr Max | A | 0,00 | | 627 | |
| P2.6.15.7 | Magnetizing time at start | 0,0 | 30,000 | s | 0,000 | | 628 | |
| P2.6.15.8 | 0-speed time at start | 0 | 32000 | ms | 100 | | 615 | |
| P2.6.15.9 | 0-speed time at stop | 0 | 32000 | ms | 100 | | 616 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| P2.6.15.10 | Start-up torque | 0 | 3 | | 0 | | 621 | 0=Not used<br>1=Torque memory<br>2=Torque reference<br>3=Start-up torque fwd/rev |
| P2.6.15.11 | Start-up torque FWD | –300,0 | 300,0 | % | 0,0 | | 633 | |
| P2.6.15.12 | Start-up torque REV | –300,0 | 300,0 | % | 0,0 | | 634 | |
| P2.6.15.13 | Encoder filter time | 0 | 1000 | ms | 0 | | 618 | |
| P2.6.15.14 | Current control P gain | 0,00 | 100,00 | % | 40,00 | | 617 | |
| P2.6.15.15 | Stop State Flux | 0,0 | 150,0 | % | 100,0 | | 1401 | |
| P2.6.15.16 | Flux Off Delay | 0 | 32000 | s | 0 | | 1402 | |

*Table 5-15. Motor control parameters, G2.6*

## 5.9 Protections (Control keypad: Menu M2 → G2.7)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.7.1 | Response to 4mA reference fault | 0 | 5 | | 0 | | 700 | **0**=No response<br>**1**=Warning<br>**2**=Warning+Previous Freq.<br>**3**=Wrng+PresetFreq 2.7.2<br>**4**=Fault,stop acc. to 2.4.7<br>**5**=Fault,stop by coasting |
| P2.7.2 | 4mA reference fault frequency | 0,00 | Par. 2.1.2 | Hz | 0,00 | | 728 | |
| P2.7.3 | Response to external fault | 0 | 3 | | 2 | | 701 | **0**=No response<br>**1**=Warning<br>**2**=Fault,stop acc. to 2.4.7<br>**3**=Fault,stop by coasting |
| P2.7.4 | Input phase supervision | 0 | 3 | | 0 | | 730 | |
| P2.7.5 | Response to undervoltage fault | 0 | 1 | | 0 | | 727 | **0**=Fault stored in history<br>**1**=Fault not stored |
| P2.7.6 | Output phase supervision | 0 | 3 | | 2 | | 702 | **0**=No response<br>**1**=Warning<br>**2**=Fault,stop acc. to 2.4.7<br>**3**=Fault,stop by coasting |
| P2.7.7 | Earth fault protection | 0 | 3 | | 2 | | 703 | |
| P2.7.8 | Thermal protection of the motor | 0 | 3 | | 2 | | 704 | |
| P2.7.9 | Motor ambient temperature factor | –100,0 | 100,0 | % | 0,0 | | 705 | |
| P2.7.10 | Motor cooling factor at zero speed | 0,0 | 150,0 | % | 40,0 | | 706 | |
| P2.7.11 | Motor thermal time constant | 1 | 200 | min | 45 | | 707 | |
| P2.7.12 | Motor duty cycle | 0 | 100 | % | 100 | | 708 | |
| P2.7.13 | Stall protection | 0 | 3 | | 0 | | 709 | **0**=No response<br>**1**=Warning<br>**2**=Fault,stop acc. to 2.4.7<br>**3**=Fault,stop by coasting |
| P2.7.14 | Stall current | 0,1 | $I_{nMotor}$ x 2 | A | $I_L$ | | 710 | |
| P2.7.15 | Stall time limit | 1,00 | 120,00 | s | 15,00 | | 711 | |
| P2.7.16 | Stall frequency limit | 1,0 | Par. 2.1.2 | Hz | 25,0 | | 712 | |
| P2.7.17 | Underload protection | 0 | 3 | | 0 | | 713 | **0**=No response<br>**1**=Warning<br>**2**=Fault,stop acc. to 2.4.7<br>**3**=Fault,stop by coasting |
| P2.7.18 | Field weakening area load | 10 | 150 | % | 50 | | 714 | |
| P2.7.19 | Zero frequency load | 5,0 | 150,0 | % | 10,0 | | 715 | |
| P2.7.20 | Underload protection time limit | 2 | 600 | s | 20 | | 716 | |
| P2.7.21 | Response to thermistor fault | 0 | 3 | | 2 | | 732 | **0**=No response<br>**1**=Warning<br>**2**=Fault,stop acc. to 2.4.7<br>**3**=Fault,stop by coasting |

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.7.22 | Response to fieldbus fault | 0 | 3 | | 2 | | 733 | See P2.7.21 |
| P2.7.23 | Response to slot fault | 0 | 3 | | 2 | | 734 | See P2.7.21 |
| P2.7.24 | Encoder fault respoce | 0 | 3 | | 1 | | 1616 | See P2.7.21 |
| P2.7.25 | Gear ratio | 0,00 | 320,00 | | 1,0 | | 1617 | |
| P2.7.26 | Synchronization fault mode | 0 | 3 | | 2 | | 1619 | |
| P2.7.27 | Synchronization window | 0 | 32000 | | 500 | | 1618 | |
| P2.7.28 | Synchronization monitor also in frequency control | 0 | 1 | | 0 | | 1672 | **0**=No<br>**1**=Yes |
| P2.7.29 | Low rounds fault limit | 0 | 32000 | r | 0 | | 1646 | Only for absolute encoder |
| P2.7.30 | High rounds fault limit | 0 | 32000 | r | 4000 | | 1648 | Only for absolute encoder |
| P2.7.31 | SystemBus communication fault delay | 0 | 30,00 | s | 3,00 | | 1751 | |
| P2.7.32 | Out of Area hysteresis | 0 | 60000 | | 15 | | 1650 | |
| P2.7.33 | Out Of Area Stop Mode | 0 | 2 | | 1 | | 1575 | **0**=Coasting<br>**1**=System defined<br>**2**=Ramping |
| P2.7.34 | Warning area low | 0 | 60000 | | 100 | | 1550 | |
| P2.7.35 | Warning area high | 0 | 60000 | | 100 | | 1607 | |
| P2.7.36 | Warning area speed | 0,00 | 320,00 | Hz | 5,00 | | 1552 | |

*Table 5-16. Protections, G2.7*

## 5.10 Autorestart parameters (Control keypad: Menu M2 → G2.8)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.8.1 | Wait time | 0,10 | 10,00 | s | 0,50 | | 717 | |
| P2.8.2 | Trial time | 0,00 | 60,00 | s | 30,00 | | 718 | |
| P2.8.3 | Start function | 0 | 2 | | 0 | | 719 | **0**=Ramp<br>**1**=Flying start<br>**2**=According to par. 2.4.6 |
| P2.8.4 | Number of tries after undervoltage trip | 0 | 10 | | 0 | | 720 | |
| P2.8.5 | Number of tries after overvoltage trip | 0 | 10 | | 0 | | 721 | |
| P2.8.6 | Number of tries after overcurrent trip | 0 | 3 | | 0 | | 722 | |
| P2.8.7 | Number of tries after reference trip | 0 | 10 | | 0 | | 723 | |
| P2.8.8 | Number of tries after motor temperature fault trip | 0 | 10 | | 0 | | 726 | |
| P2.8.9 | Number of tries after external fault trip | 0 | 10 | | 0 | | 725 | |

*Table 5-17. Autorestart parameters, G2.8*

## 5.11 Positioning parameters (Control keypad: Menu M2 → G2.9)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.9.1 | Panel positioning Control Word (PPCW) | 0 | 10 | | 0 | | 1643 | **0**=No Action<br>**1**=Set Zero Position (ABS)<br>**2**=Set Total Rounds<br>**3**=Set Ref Offset Point<br>**4**=Save current position<br>**5**=Recall saved position (ModBus)<br>**6**=Calibrated (ABS)<br>**7**=Reset Calibration<br>**8**=Reset Position (INC)<br>**9**=Set INC Calibration Position<br>**10**=Set INC total rounds |

*Table 5-18. Panel Positioning Control Word parameters, G2.9*

### *5.11.1 Positioning Basic Settings (Menu M2 → G2.9.2)*

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.9.2.1 | Total Distance | 0 | 60000 | | 10000 | | 1500 | |
| P2.9.2.2 | Total rotations | 0 | 65535 | r | 100,0 | | 1501 | |
| P2.9.2.3 | Rotations decimals | 0 | 4 | Dec. | 1 | | 1502 | |
| P2.9.2.4 | High Level Speed | P2.9.2.6 | 320,00 | Hz | 50,00 | | 1509 | |
| P2.9.2.5 | Middle level speed distance | P2.9.2.7 | P2.9.2.1 | | 2700 | | 1506 | |
| P2.9.2.6 | Middle level speed | P2.9.2.8 | P2.9.2.4 | | 25,00 | | 1508 | |
| P2.9.2.7 | Low level speed distance | P2.9.2.9 | P2.9.2.5 | | 700 | | 1505 | |
| P2.9.2.8 | Low level speed | 0,00 | P2.9.2.6 | | 3,00 | | 1507 | |
| P2.9.2.9 | Stop hysteresis | 0 | P2.9.2.7 | | 25 | | 1504 | |
| P2.9.2.10 | High level speed 2 | P2.9.2.11 | P2.1.2 | Hz | 25,00 | | 1512 | |
| P2.9.2.11 | Middle level speed 2 | P2.9.2.12 | P2.9.2.10 | Hz | 12,50 | | 1511 | |
| P2.9.2.12 | Low level speed 2 | 0,00 | P2.9.2.11 | Hz | 1,50 | | 1510 | |
| P2.9.2.13 | Teaching enabled | 0 | 1 | | 0 | | 1513 | |
| P2.9.2.14 | Automatic stop when calibrated | 0 | 1 | | 1 | | 1610 | **0**=No<br>**1**=Yes |

*Table 5-19. Positioning basic settings parameters, G2.9.2*

### *5.11.2 Absolute encoder parameters (Menu M2 → G2.9.3)*

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.9.3.1 | Zero revolution | 0 | 32000 | r | 0 | | 1627 | |
| P2.9.3.2 | Zero position | 0 | 32000 | Dec | 0 | | 1628 | |
| P2.9.3.3 | Target Offset | 0 | 30000 | | 0 | | 1637 | |
| P2.9.3.4 | Automatic calibration delay | 0,00 | 10,00 | s | 2,00 | | 1752 | |

*Table 5-20. Absolute encoder parameters, G2.9.3*

### *5.11.3 Incremental encoder parameters (Menu M2 → G2.9.4)*

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.9.4.1 | Calibration rounds | 0 | 65000 | r | 0 | | 1573 | |
| P2.9.4.1 | Calibration fragments | 0 | 65535 | Dec | 0 | | 1574 | |

*Table 5-21. Incremental encoder parameters, G2.9.4*

## 5.12 Fixed Positions parameters (Control keypad: Menu M2 → G2.10)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.10.1 | Position 0 | P2.7.34 | P2.7.35 | | 100 | | 1545 | |
| P2.10.2 | Position 1 | P2.7.34 | P2.7.35 | | 100 | | 1514 | |
| P2.10.3 | Position 2 | P2.7.34 | P2.7.35 | | 438 | | 1515 | |
| P2.10.4 | Position 3 | P2.7.34 | P2.7.35 | | 776 | | 1516 | |
| P2.10.5 | Position 4 | P2.7.34 | P2.7.35 | | 1114 | | 1517 | |
| P2.10.6 | Position 5 | P2.7.34 | P2.7.35 | | 1452 | | 1518 | |
| P2.10.7 | Position 6 | P2.7.34 | P2.7.35 | | 1790 | | 1519 | |
| P2.10.8 | Position 7 | P2.7.34 | P2.7.35 | | 2128 | | 1520 | |
| P2.10.9 | Position 8 | P2.7.34 | P2.7.35 | | 2466 | | 1521 | |
| P2.10.10 | Position 9 | P2.7.34 | P2.7.35 | | 2803 | | 1522 | |
| P2.10.11 | Position 10 | P2.7.34 | P2.7.35 | | 3141 | | 1523 | |
| P2.10.12 | Position 11 | P2.7.34 | P2.7.35 | | 3479 | | 1524 | |
| P2.10.13 | Position 12 | P2.7.34 | P2.7.35 | | 3817 | | 1525 | |
| P2.10.14 | Position 13 | P2.7.34 | P2.7.35 | | 4155 | | 1526 | |
| P2.10.15 | Position 14 | P2.7.34 | P2.7.35 | | 4493 | | 1527 | |
| P2.10.16 | Position 15 | P2.7.34 | P2.7.35 | | 4831 | | 1528 | |
| P2.10.17 | Position 16 | P2.7.34 | P2.7.35 | | 5169 | | 1529 | |
| P2.10.18 | Position 17 | P2.7.34 | P2.7.35 | | 5507 | | 1530 | |
| P2.10.19 | Position 18 | P2.7.34 | P2.7.35 | | 5845 | | 1531 | |
| P2.10.20 | Position 19 | P2.7.34 | P2.7.35 | | 6183 | | 1532 | |
| P2.10.21 | Position 20 | P2.7.34 | P2.7.35 | | 6521 | | 1533 | |
| P2.10.22 | Position 21 | P2.7.34 | P2.7.35 | | 6859 | | 1534 | |
| P2.10.23 | Position 22 | P2.7.34 | P2.7.35 | | 7197 | | 1535 | |
| P2.10.24 | Position 23 | P2.7.34 | P2.7.35 | | 7534 | | 1536 | |
| P2.10.25 | Position 24 | P2.7.34 | P2.7.35 | | 7872 | | 1537 | |
| P2.10.26 | Position 25 | P2.7.34 | P2.7.35 | | 8210 | | 1538 | |
| P2.10.27 | Position 26 | P2.7.34 | P2.7.35 | | 8548 | | 1539 | |
| P2.10.28 | Position 27 | P2.7.34 | P2.7.35 | | 8886 | | 1540 | |
| P2.10.29 | Position 28 | P2.7.34 | P2.7.35 | | 9224 | | 1541 | |
| P2.10.30 | Position 29 | P2.7.34 | P2.7.35 | | 9562 | | 1542 | |
| P2.10.31 | Position 30 | P2.7.34 | P2.7.35 | | 9900 | | 1543 | |
| P2.10.32 | Position 31 | P2.7.34 | P2.7.35 | | 5000 | | 1544 | |

*Table 5-22. Fixed positions parameters parameters, G2.10*

## 5.13 Brake Control parameters (Control keypad: Menu M2 → G2.11)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.11.1 | Current limit | 0 | Varies | A | 0 | | 1587 | |
| P2.11.2 | Torque limit | 0,0 | 100,0 | % | 0 | | 1588 | |
| P2.11.3 | Frequency limit open | 0,00 | P2.1.7 | Hz | 0 | | 1589 | |
| P2.11.4 | Brake opening delay | 0,00 | 10,00 | s | 0 | | 1590 | |
| P2.11.5 | Frequency limit close | 0,00 | P2.1.7 | Hz | 0 | | 1591 | |
| P2.11.6 | Brake closing delay | 0,00 | 10,00 | s | 0 | | 1592 | |
| P2.11.7 | Mechanical opening delays | 0,00 | 10,00 | s | 0 | | 1594 | |

*Table 5-23. Brake control parameters, G2.11*

## 5.14 Fieldbus parameters (Control Keypad: Menu M2 →G2.12)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.12.1 | Fieldbus data out 1 selection | 0 | 10000 | | 1634 | | 852 | Choose monitoring data with parameter ID |
| P2.12.2 | Fieldbus data out 2 selection | 0 | 10000 | | 1553 | | 853 | Choose monitoring data with parameter ID |
| P2.12.3 | Fieldbus data out 3 selection | 0 | 10000 | | 1701 | | 854 | Choose monitoring data with parameter ID |
| P2.12.4 | Fieldbus data out 4 selection | 0 | 10000 | | 26 | | 855 | Choose monitoring data with parameter ID |
| P2.12.5 | Fieldbus data out 5 selection | 0 | 10000 | | 3 | | 856 | Choose monitoring data with parameter ID |
| P2.12.6 | Fieldbus data out 6 selection | 0 | 10000 | | 4 | | 857 | Choose monitoring data with parameter ID |
| P2.12.7 | Fieldbus data out 7 selection | 0 | 10000 | | 1 | | 858 | Choose monitoring data with parameter ID |
| P2.12.8 | Fieldbus data out 8 selection | 0 | 10000 | | 2 | | 859 | Choose monitoring data with parameter ID |
| P2.12.9 | Process data in 1 control ID | 0 | 10000 | | 0 | | 1740 | Choose controlled data with ID number |
| P2.12.10 | Process data in 2 control ID | 0 | 10000 | | 0 | | 1741 | Choose controlled data with ID number |
| P2.12.11 | Process data in 3 control ID | 0 | 10000 | | 0 | | 1742 | Choose controlled data with ID number |
| P2.12.12 | Process data in 4 control ID | 0 | 10000 | | 0 | | 1743 | Choose controlled data with ID number |
| P2.12.13 | Process data in 5 control ID | 0 | 10000 | | 0 | | 1744 | Choose controlled data with ID number |
| P2.12.14 | Process data in 6 control ID | 0 | 10000 | | 0 | | 1745 | Choose controlled data with ID number |
| P2.12.15 | Process data in 7 control ID | 0 | 10000 | | 0 | | 1746 | Choose controlled data with ID number |
| P2.12.16 | Process data in 8 control ID | 0 | 10000 | | 0 | | 1747 | Choose controlled data with ID number |
| P2.12.17 | FB low area point | 0 | 60000 | | 2550 | | 1760 | PSW b3 |
| P2.12.18 | FB high area point | 0 | 60000 | | 7450 | | 1761 | PSW b4 |

*Table 5-24. Fieldbus parameters*

## 5.15 SystemBus parameters (Control keypad: Menu M2 → G2.11)

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P2.13.1 | Master Follower mode selection | 0 | 2 | | 0 | | 1622 | 0=Not used<br>1=Parameter select<br>2=Master<br>3=Follower |
| P2.13.2 | Maximum ramp correction | 0,00 | 3,00 | s | 0,50 | | 1624 | Max Correction when error = P2.7.27 |
| P2.13.3 | Maximum speed correction | 0,00 | 10,00 | Hz | 1,00 | | 1631 | Max Correction when error = P2.7.27 |
| P2.13.4 | Follower position reference selection | 0 | 3 | | 3 | | 1635 | 0=Din Sel. Position Ref.<br>1=AI Position Ref.<br>2=FB Position Ref.<br>3=Master Position Ref |
| P2.13.5 | Master offset | 0 | 3000 | | 0 | | 1640 | |
| P2.13.6 | Follower offset | 0 | 3000 | | 0 | | 1641 | |
| P2.13.7 | Parameter selected master follower | 0 | 1 | | 0 | | 1644 | 0= Follower<br>1= Master |

*Table 5-25. SystemBus parameters, G2.13*

## 5.16 Keypad control (Control keypad: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed below. See the Keypad control menu in the Vacon NX User's Manual.

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note |
|---|---|---|---|---|---|---|---|---|
| P3.1 | Control place | 1 | 3 | | 2 | | 125 | 0 = PC Control<br>1 = I/O terminal<br>2 = Keypad<br>3 = Fieldbus |
| R3.2 | Keypad reference | Par. 2.1.1 | Par. 2.1.2 | Hz | | | | |
| P3.3 | Direction (on keypad) | 0 | 1 | | 0 | | 123 | 0 = Forward<br>1 = Reverse |
| R3.4 | Stop button | 0 | 1 | | 1 | | 114 | 0=Limited function of Stop button<br>1=Stop button always enabled |

*Table 5-26. Keypad control parameters, M3*

## 5.17 System menu (Control keypad: M6)

For parameters and functions related to the general use of the frequency converter, such as application and language selection, customised parameter sets or information about the hardware and software, see the product's User's Manual.

## 5.18 Expander boards (Control keypad: Menu M7)

The M7 menu shows the expander and option boards attached to the control board and board-related information. For more information, see the product's User's Manual.

## 6. Description of parameters

Application is based on one of All-In-One applications, see parameter description below ID 1500 from All-In-One application manual.

## 7. Synchronise Positioning parameters

*1548* *Position reference select*
With this parameter it's possible to select where position reference is coming
0 = Digital input selection with fixed positions
1 = Analogue position reference
2 = Fieldbus position reference (Default)
3 = Master position reference

*1549* *Position reference analogue input*
Select analogue input for position reference using TTF method.

*1564* *Positioning mode on/off*
Select digital input to activate positioning mode from I/O.

*1566* *Calibration*
Select digital input to give calibration command from I/O

*1567* *Digital input fixed reference B0*
*1568* *Digital input fixed reference B1*
*1569* *Digital input fixed reference B2*
*1570* *Digital input fixed reference B3*
*1571* *Digital input fixed reference B4*
Select fixed position reference with a combination of digital inputs.

| Code | Parameter | Min | Max | Unit | Default | Cust | ID | Note | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Digital input fixed reference Bx | | | | | | | | 0 | 1 | 2 | 2 | 4 |
| P2.10.1 | Position 0 | P2.7.34 | P2.7.35 | | 100 | | 1545 | 0 | 0 | 0 | 0 | 0 |
| P2.10.2 | Position 1 | P2.7.34 | P2.7.35 | | 100 | | 1514 | 0 | 0 | 0 | 0 | 1 |
| P2.10.3 | Position 2 | P2.7.34 | P2.7.35 | | 438 | | 1515 | 0 | 0 | 0 | 1 | 0 |
| P2.10.4 | Position 3 | P2.7.34 | P2.7.35 | | 776 | | 1516 | 0 | 0 | 0 | 1 | 1 |
| P2.10.5 | Position 4 | P2.7.34 | P2.7.35 | | 1114 | | 1517 | 0 | 0 | 1 | 0 | 0 |
| P2.10.6 | Position 5 | P2.7.34 | P2.7.35 | | 1452 | | 1518 | 0 | 0 | 1 | 0 | 1 |
| P2.10.7 | Position 6 | P2.7.34 | P2.7.35 | | 1790 | | 1519 | 0 | 0 | 1 | 1 | 0 |
| P2.10.8 | Position 7 | P2.7.34 | P2.7.35 | | 2128 | | 1520 | 0 | 0 | 1 | 1 | 1 |
| P2.10.9 | Position 8 | P2.7.34 | P2.7.35 | | 2466 | | 1521 | 0 | 1 | 0 | 0 | 0 |
| P2.10.10 | Position 9 | P2.7.34 | P2.7.35 | | 2803 | | 1522 | 0 | 1 | 0 | 0 | 1 |
| P2.10.11 | Position 10 | P2.7.34 | P2.7.35 | | 3141 | | 1523 | 0 | 1 | 0 | 1 | 0 |
| P2.10.12 | Position 11 | P2.7.34 | P2.7.35 | | 3479 | | 1524 | 0 | 1 | 0 | 1 | 1 |
| P2.10.13 | Position 12 | P2.7.34 | P2.7.35 | | 3817 | | 1525 | 0 | 1 | 1 | 0 | 0 |
| P2.10.14 | Position 13 | P2.7.34 | P2.7.35 | | 4155 | | 1526 | 0 | 1 | 1 | 0 | 1 |
| P2.10.15 | Position 14 | P2.7.34 | P2.7.35 | | 4493 | | 1527 | 0 | 1 | 1 | 1 | 0 |
| P2.10.16 | Position 15 | P2.7.34 | P2.7.35 | | 4831 | | 1528 | 0 | 1 | 1 | 1 | 1 |
| P2.10.17 | Position 16 | P2.7.34 | P2.7.35 | | 5169 | | 1529 | 1 | 0 | 0 | 0 | 0 |
| P2.10.18 | Position 17 | P2.7.34 | P2.7.35 | | 5507 | | 1530 | 1 | 0 | 0 | 0 | 1 |
| P2.10.19 | Position 18 | P2.7.34 | P2.7.35 | | 5845 | | 1531 | 1 | 0 | 0 | 1 | 0 |
| P2.10.20 | Position 19 | P2.7.34 | P2.7.35 | | 6183 | | 1532 | 1 | 0 | 0 | 1 | 1 |
| P2.10.21 | Position 20 | P2.7.34 | P2.7.35 | | 6521 | | 1533 | 1 | 0 | 1 | 0 | 0 |
| P2.10.22 | Position 21 | P2.7.34 | P2.7.35 | | 6859 | | 1534 | 1 | 0 | 1 | 0 | 1 |
| P2.10.23 | Position 22 | P2.7.34 | P2.7.35 | | 7197 | | 1535 | 1 | 0 | 1 | 1 | 0 |
| P2.10.24 | Position 23 | P2.7.34 | P2.7.35 | | 7534 | | 1536 | 1 | 0 | 1 | 1 | 1 |
| P2.10.25 | Position 24 | P2.7.34 | P2.7.35 | | 7872 | | 1537 | 1 | 1 | 0 | 0 | 0 |
| P2.10.26 | Position 25 | P2.7.34 | P2.7.35 | | 8210 | | 1538 | 1 | 1 | 0 | 0 | 1 |
| P2.10.27 | Position 26 | P2.7.34 | P2.7.35 | | 8548 | | 1539 | 1 | 1 | 0 | 1 | 0 |
| P2.10.28 | Position 27 | P2.7.34 | P2.7.35 | | 8886 | | 1540 | 1 | 1 | 0 | 1 | 1 |
| P2.10.29 | Position 28 | P2.7.34 | P2.7.35 | | 9224 | | 1541 | 1 | 1 | 1 | 0 | 0 |
| P2.10.30 | Position 29 | P2.7.34 | P2.7.35 | | 9562 | | 1542 | 1 | 1 | 1 | 0 | 1 |
| P2.10.31 | Position 30 | P2.7.34 | P2.7.35 | | 9900 | | 1543 | 1 | 1 | 1 | 1 | 0 |
| P2.10.32 | Position 31 | P2.7.34 | P2.7.35 | | 5000 | | 1544 | 1 | 1 | 1 | 1 | 1 |

*Table 7-1.*

*1605* *External brake enable*
When input is FALSE brake will not open even if drive conditions are met

*1609* *Run enable Low end*
*1610* *Run enable high end*
If one of these input goes FALSE drive will stop immediately however it's possible to start the drive to run opposite direction where limit was opened.

*1611* *Digital input for calibration reset*
Input for resetting calibration that it's possible to make new calibration

*1612* *Calibration negative*
Select digital input to give negative calibration command from I/O

*1613* *Input for prohibiting calibration signal*
Prohibit calibration input command used when car needs to come from certain direction to calibration point.

*1563* *Positioning speed group 2*
Activates positioning speed group 2

*1579* *High level speed scaling input*
With this input it's possible to select positioning speed level scaling input
0 = Not used
1 = AI1
2 = A2
3 = Fielbus

*1582* *High Speed 1 Scaling Min*
*1584* *High Speed 1 Scaling Max*
*1583* *High Speed 2 Scaling Min*
*1585* *High Speed 2 Scaling Max*
With these parameter it's possible to give different scaling values to both speed groups.

*1572* *Automatic ramp scaling*
When switching from positioning group to other, function tries to scale frequency ramps so, that deceleration is smoother. This function works best, when the frequencies of speed groups are given in a same ratio.

*1614* *Ramp scale frequency*
This is the frequency witch drive will ramp in times of P2.1.3 Acceleration time and P2.1.4 Deceleration time.

*1616* *Encoder fault mode*
This function will monitor that output frequency and encoder frequency are in same level.

*1617* *Gear ratio*
If encoder is after gear, here it's possible to se gear ration that encoder monitoring will work also in this case.

*1619* *Synchronising fault mode*
When follower drive go beyond it's positioning window here you can select proper response for that.
0 = No response
1 = Warning
2 = Fault, stop mode after fault according to ID506
3 = Fault, stop mode after fault always by coasting

*1618* *Synchronising window*
Positioning error when follower drive is out of positioning window.

*1672* *Synchronising monitor for speed control*
When drive is in speed controlled but still in master follower mode it possible to monitor positioning error. Both drives mast have "Calibration OK".

*1646* *Low round fault*
*1648* *High round fault*
When drive uses absolute encoder it's possible to set fault limits when absolute encoder information exceed these limits.

*1571* *System Bus fault delay*
Delay until fault is carried out when communication is missing between master and follower drive.

*1650* *Out of area hysteretic*
Out of area fault is generated when actual position is more than total trip + this parameter.

*1575* *Out of area stop mode*
When out of area fault occurs here you can select the stop mode.
0 = Coasting
1 = System defined
1 = Ramping

*1550* *Warning area low*
*1607* *Warning area high*
When actual position is near end limit warning is generated and speed is dropped.

*1552* *Warning area speed*
When actual position is in warning area speed is dropped to this value.

*1643* *Panel positioning control word*
To this parameter have been gathered most common command

0=No Action

1=Set Zero Position (ABS)
Sets zero position information from absolute encoder to frequency converter memory. This point is Zero actual position when using absolute encoder.

2=Set Total Rounds
When car is driven manually to high end here you can set the total rounds to memory. If you are using incremental encoder remember to reset position in low end.

3=Set Ref Offset Point
Possibility to set different zero actual position when using FB control. Internal actual position is FB Actual postion – this offset.

4=Save current position
Saves current position to memory for further use

5=Recall saved position (ModBus)
Recalls saved position to reference.

6=Calibrated (ABS)
When using absolute encoder you need to give separate information when drive is calibrated after this dive will make automatic calibration during power up.

7=Reset Calibration
Resets calibration that it's possible to make new calibration

8=Reset Position (INC)
Sets incremental rotations and fragments to zero that it's possible to use PCW command to define total rotations ans calibration position

9=Set INC Calibration Position
Stores rotations and fragments to memory from zero position to calibration position

10=Set INC total rounds
Stores total round to memory when using incremental encoder

*1500 Total distance*
Total distance units. Default 10000 = 100,00 % = Total rotations

*1501 Total rotations*
Number of rotations. From low end to high end. Value is UINT, select proper decimal number with ID 1502

*1502 Rotations decimal*
Number of decimals in Total rotations. If you can use 2 decimal optimal accuracy is 1/100 of rotation when 1 decimal, accuracy is 1/10 or rotation.

*1509 High level speed*
*1506 Mid level speed distance*
*1508 Mid level speed*
*1505 Low level speed distance*
*1507 Low level speed*
*1504 Stop hysteric*
*1512 High level speed 2*
*1511 Mid level speed 2*
*1511 Low level speed 2*
See chapter 4 Position sequence

*1513 Teaching*
Teaching is possible after the calibration. Conveyor is driven to the wanted position and position is set to memory by input "Calibration". Position is stored to group G2.10, which is selected with the combination of digital inputs.

*1610* *Stop drive when pulses are calibrated*
When drive receives rising edge of calibration input drive can be stopped automatically with this parameter

*1627* *Zero revolution*
*1628* *Zero position*
Absolute encoder values in Low end

*1637* *Target offset*
Adds some unit to reference e.g. mechanical zero point is different than operational zero point.

*1573* *Calibration round*
*1574* *Calibration fragments*
Incremental position form low end to calibration point.

*1587* *Current limit*
Motor current must exceed this value before brake is opened

*1588* *Torque limit*
Motor torque must exceed this value before brake is opened

*1589* *Frequency limit open*
Output frequency must exceed this value before brake is opened

*1590* *Brake opening delay*
Delay for opening brake when limit are met.

*1591* *Frequency limit close*
When frequency goes below this value brake is closed

*1592* *Brake closing delay*
Delay for closing brake when limits are met.

*1594* *Mechanical delay*
Delay for encoder monitor

*852 to 859* *Fieldbus data out selections 1 to 8*

Using these parameters, you can monitor any monitoring or parameter value from the fieldbus. Enter the ID number of the item you wish to monitor for the value of these parameters.

Some typical values:

| | | | |
|---|---|---|---|
| 1 | Output frequency | 15 | Digital inputs 1,2,3 statuses |
| 2 | Motor speed | 16 | Digital inputs 4,5,6 statuses |
| 3 | Motor current | 17 | Digital and relay output statuses |
| 4 | Motor torque | 25 | Frequency reference |
| 5 | Motor power | 26 | Analogue output current |
| 6 | Motor voltage | 27 | AI3 |
| 7 | DC link voltage | 28 | AI4 |
| 8 | Unit temperature | 31 | AO1 (expander board) |
| 9 | Motor temperature | 32 | AO2 (expander board) |
| 13 | AI1 | 37 | Active fault 1 |
| 14 | AI2 | | |

*Table 2.*

*1740 to 1747* *Fieldbus data IN selections 1 to 8*

Using these parameters, you can control any monitoring or parameter value from the fieldbus. Enter the ID number of the item you wish to control for the value of these parameters.

*1760* *Low area point*

*1761* *High area point*

PSC b3 & b4

*1622* *Master/Follower selection*

Select Master Follower mode

0 = No used

1 = Parameter selection

2 = Master

3 = Follower

*1624* *Maximum ramp correction*

When position error between master and follower is equal to positioning window size during acceleration and deceleration this is how much ramp is corrected.

*1631* *Maximum frequency correction*

When position error between master and follower is equal to positioning window size during level speed this is how much frequency reference is corrected.

*1635* *Follower position reference*
When drive is follower this selection is used for position reference
0 = Digital input selection with fixed positions
1 = Analogue position reference
2 = Fieldbus position reference
3 = Master position reference (Default)

*1640* *Master offset*
Additional offset to follower for monitoring position error.

*1641* *Follower offset*
Additional offset to follower for monitoring position error.

*1644* *Parameter selected master follower mode*
0 = Follower
1 = Master

## 7.1 Keypad control parameters

Unlike the parameters listed above, these parameters are located in the M3 menu of the control keypad. The reference parameters do not have an ID number.

*114* *Stop button activated* *[3.4, 3.6]*
If you wish to make the Stop button a "hotspot" which always stops the drive regardless of the selected control place, give this parameter the value 1.

See also parameter ID125.

*125* *Control Place* *[3.1]*
The active control place can be changed with this parameter. For more information, see the product's User's Manual.

Pushing the *Start button* for 3 seconds selects the control keypad as the active control place and copies the Run status information (Run/Stop, direction and reference).

*123* *Keypad Direction* *[3.3]*
0 Forward: The rotation of the motor is forward, when the keypad is the active control place.

1 Reverse: The rotation of the motor is reversed, when the keypad is the active control place.

For more information, see the product's User's Manual

*R3.2* *Keypad Reference* *[3.2]*
The frequency reference can be adjusted from the keypad with this parameter.

The output frequency can be copied as the keypad reference by pushing the *Stop button* for 3 seconds when you are on any of the pages of menu *M3.* For more information, see the product's User's Manual.

# 8. Appendices

In this chapter you will find additional information on special parameter groups. Such groups are:

- *Parameters of External brake control with additional limits (Chapter 8.1)*
- *Closed Loop parameters (Chapter 8.2)*
- *Parameters of Motor thermal protection (Chapter 8.3)*
- *Parameters of Stall protection (Chapter 8.4)*
- *Parameters of Underload protection (Chapter 8.5)*
- *Fieldbus control parameters (Chapter 8.6)*

## 8.1 External brake control with additional limits (ID's 315, 316, 346 to 349, 352, 353)

The external brake used for additional braking can be controlled through parameters ID315, ID316, ID346 to ID349 and ID352/ID353. Selecting On/Off Control for the brake, defining the frequency or torque limit(s) the brake should react to and defining the Brake-On/-Off delays will allow an effective brake control. See Figure 8-1.

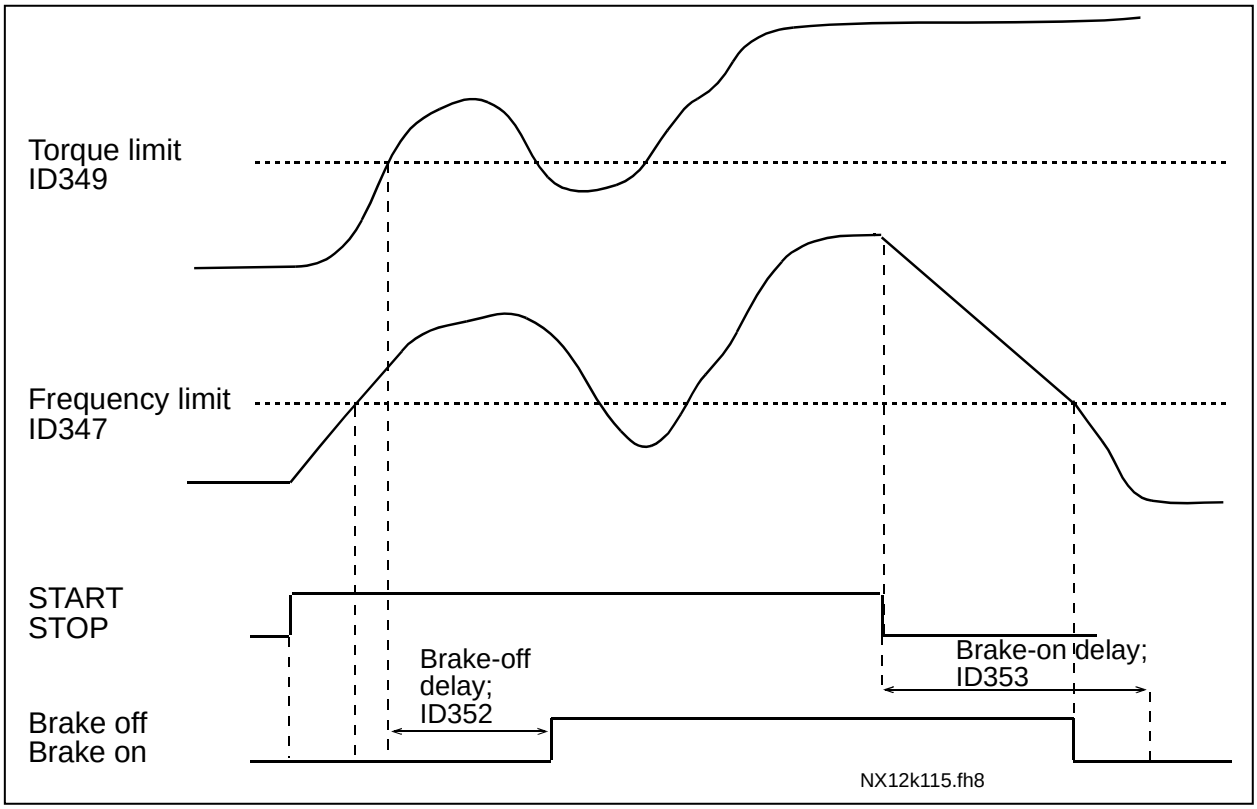



*Figure 8-1. Brake control with additional limits*

In Figure 8-1 above, the brake control is set to react to both the torque supervision limit (par. ID349) and frequency supervision limit (ID347). Additionally, the same frequency limit is used for both brake-off and brake-on control by giving parameter ID346 the value **4**. Use of two different frequency limits is also possible. Then parameters ID315 and ID346 must be given the value **3**.

**Brake-off:** In order for the brake to release, three conditions must be fulfilled: 1) the drive must be in Run state, 2) the torque must be over the set limit (if used) and 3) the output frequency must be over the set limit (if used).

**Brake-on:** Stop command activates the brake delay count and the brake is closed when the output frequency falls below the set limit (ID315 or ID346). As a precaution, the brake closes when the brake-on delay expires, at the latest.
**Note:** A fault or Stop state will close the brake immediately without a delay.

See Figure 8-2.

**It is strongly advisable that the brake-on delay be set longer than the ramp time in order to avoid damaging of the brake.**

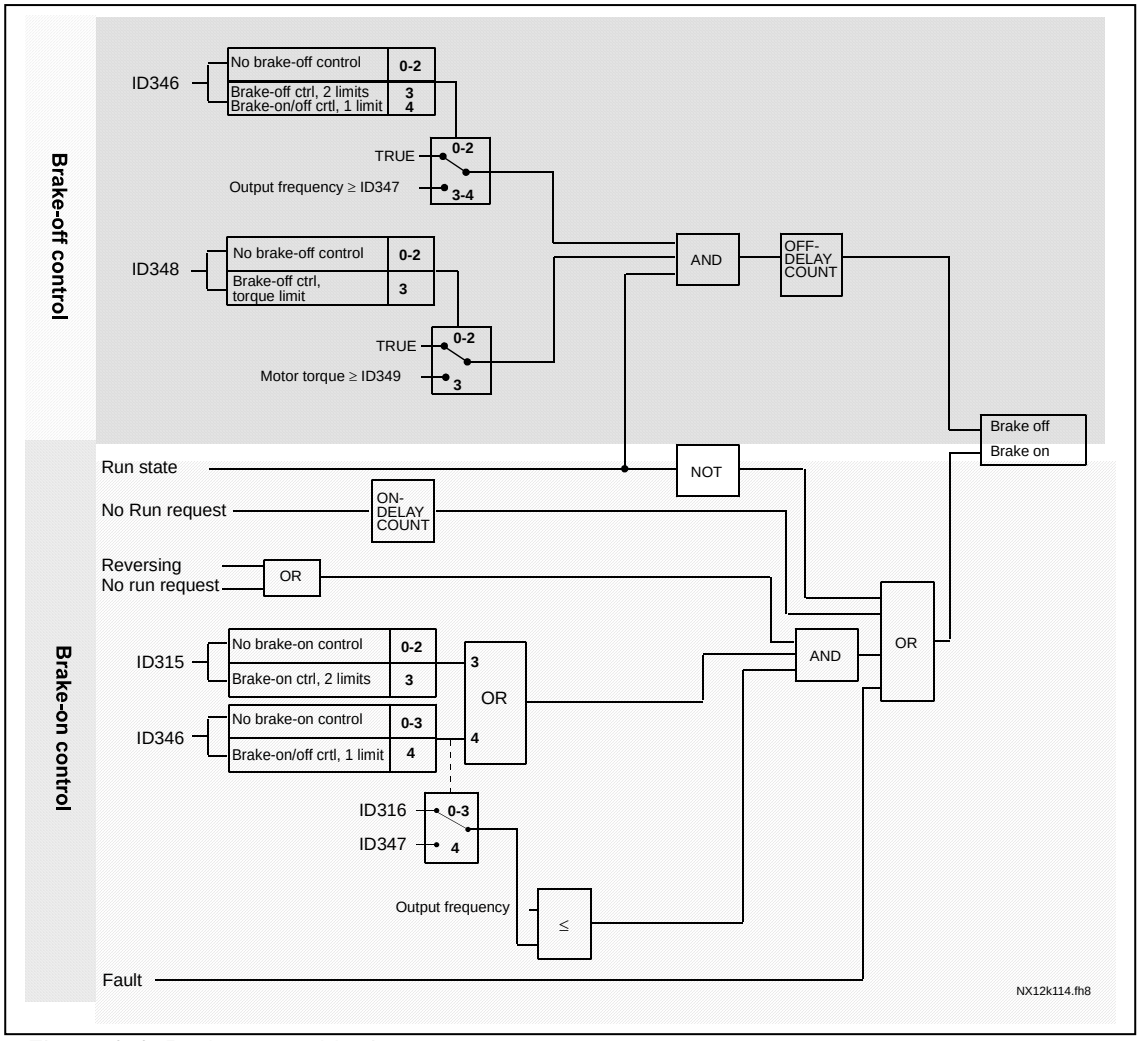



*Figure 8-2. Brake control logic*

## 8.2 Closed loop parameters (ID's 612 to 621)

Select the Closed loop control mode by setting value 3 or 4 for parameter ID600.
Closed loop control is used when enhanced performance near zero speed and better static speed accuracy with higher speeds are needed. Closed loop control mode is based on "rotor flux oriented current vector control". With this controlling principle, the phase currents are divided into a torque producing current portion and a magnetizing current portion. Thus, the squirrel cage induction machine can be controlled in a fashion of a separately excited DC motor.

Note: These parameters can be used with Vacon NXP drive only.

EXAMPLE:

Motor Control Mode = 3 (Closed loop speed control)

This is the usual operation mode when fast response times, high accuracy or controlled run at zero frequencies are needed. Encoder board should be connected to slot C of the control unit. Set the encoder P/R-parameter (P7.3.1.1). Run in open loop and check the encoder speed and direction (V7.3.2.2). Change the direction parameter (P7.3.1.2) or switch the phases of motor cables if necessary. Do not run if encoder speed is wrong. Program the no-load current to parameter ID612 and set parameter ID619 (Slip Adjust) to get the voltage slightly above the linear U/f-curve with the motor frequency at about 66% of the nominal motor frequency. The Motor Nominal Speed parameter (ID112) is critical. The Current Limit parameter (ID107) controls the available torque linearly in relative to motor nominal current.

## 8.3 Parameters of motor thermal protection (ID's 704 to 708):

General

The motor thermal protection is to protect the motor from overheating. The Vacon drive is capable of supplying higher than nominal current to the motor. If the load requires this high current there is a risk that the motor will be thermally overloaded. This is the case especially at low frequencies. At low frequencies the cooling effect of the motor is reduced as well as its capacity. If the motor is equipped with an external fan the load reduction at low speeds is small.

The motor thermal protection is based on a calculated model and it uses the output current of the drive to determine the load on the motor.

The motor thermal protection can be adjusted with parameters. The thermal current $I_T$ specifies the load current above which the motor is overloaded. This current limit is a function of the output frequency.

The thermal stage of the motor can be monitored on the control keypad display. See the product's User's Manual.

CAUTION! *The calculated model does not protect the motor if the airflow to the motor is reduced by blocked air intake grill.*

## 8.4 Parameters of Stall protection (ID's 709 to 712):

General

The motor stall protection protects the motor from short time overload situations such as one caused by a stalled shaft. The reaction time of the stall protection can be set shorter than that of motor thermal protection. The stall state is defined with two parameters, ID710 (Stall current) and ID712 (Stall frequency limit). If the current is higher than the set limit and output frequency is lower than the set limit, the stall state is true. There is actually no real indication of the shaft rotation. Stall protection is a type of overcurrent protection.

## 8.5 Parameters of Underload protection (ID's 713 to 716):

General

The purpose of the motor underload protection is to ensure that there is load on the motor when the drive is running. If the motor loses its load there might be a problem in the process, e.g. a broken belt or a dry pump.
Motor underload protection can be adjusted by setting the underload curve with parameters ID714 (Field weakening area load) and ID715 (Zero frequency load), see below. The underload curve is a squared curve set between the zero frequency and the field weakening point. The protection is not active below 5Hz (the underload time counter is stopped).

The torque values for setting the underload curve are set in percentage which refers to the nominal torque of the motor. The motor's name plate data, parameter motor nominal current and the drive's nominal current $I_H$ are used to find the scaling ratio for the internal torque value. If other than nominal motor is used with the drive, the accuracy of the torque calculation decreases.

## 8.6 Fieldbus control parameters (ID's 850 to 859)

The Fieldbus control parameters are used when the frequency or the speed reference comes from the fieldbus (Modbus, Profibus, DeviceNet etc.). With the Fieldbus Data Out Selection 1...8 you can monitor values from the fieldbus.

## 9. Faults and fault codes

When a fault is detected by the frequency converter control electronics, the drive is stopped and the symbol F together with the ordinal number of the fault, the fault code and a short fault description appear on the display. The fault can be reset with the Reset button on the control keypad or via the I/O terminal. The faults are stored in the Fault History menu, which can be browsed. The different fault codes you will find in the table below.
Shadowed rows are the A- faults (alarms) and black rows are F- faults (fault). Texts on the white base could be both A- and F- faults.

The fault codes and their possible causes are presented in the table below.

| Fault code | Fault | Possible cause | Action |
|---|---|---|---|
| 1 | Overcurrent | Frequency converter has detected too high a current (>4*$I_n$) in the motor cable:<br>- sudden heavy load increase<br>- short circuit in motor cables<br>-- unsuitable motor | Check loading.<br>Check motor.<br>Check cables. |
| 2 | Overvoltage | The DC-link voltage has exceeded the limits.<br>- too short a deceleration time<br>- high overvoltage spikes in utility | Make the deceleration time longer. Use brake chopper or brake resistor (available as options) |
| 3 | Earth fault | Current measurement has detected that the sum of motor phase current is not zero.<br>insulation failure in cables or motor | Check motor cables and motor. |
| 5 | Charging switch | The charging switch is open, when the START command has been given.<br>- faulty operation<br>- component failure | Reset the fault and restart.<br>Should the fault re-occur, contact the distributor near to you. |
| 6 | Emergency stop | Stop signal has been given from the option board. | |
| 7 | Saturation trip | Defective component | Cannot be reset from the keypad.<br>Switch off power. If this does not help contact the distributor near to you. |
| 8 | Unknown fault | The frequency converter troubleshooting system is unable to locate the fault. | Reset the fault and restart.<br>Should the fault re-occur, contact the distributor near to you. |
| 9 | Undervoltage | DC-link voltage is under the voltage limits defined in Table 4-2 of the Vacon NX User's Manual.<br>Most probable causes:<br>- too low a supply voltage<br>- frequency converter internal fault | In case of temporary supply voltage break reset the fault and restart the frequency converter. Check the supply voltage. If it is adequate, an internal failure has occurred.<br>Contact the distributor near to you. |
| 10 | Input line supervision | Input line phase is missing. | Check supply voltage and cable. |
| 11 | Output phase supervision | Current measurement has detected that there is no current in one motor phase. | Check motor cable and motor. |

| | | | |
|---|---|---|---|
| 12 | Brake chopper supervision | - no brake resistor installed<br>- brake resistor is broken<br>- brake chopper failure | Check brake resistor.<br>If the resistor is ok, the chopper is faulty. Contact the distributor near to you. |
| 13 | Frequency converter under-temperature | Heatsink temperature is under –10°C | |
| 14 | Frequency converter overtemperature | Heatsink temperature is over 90°C.<br><br>Overtemperature warning is issued when the heatsink temperature exceeds 85°C. | Check the correct amount and flow of cooling air.<br>Check the heatsink for dust.<br>Check the ambient temperature.<br>Make sure that the switching frequency is not too high in relation to ambient temperature and motor load. |
| 15 | Motor stalled | Motor stall protection has tripped. | Check motor. |
| 16 | Motor overtemperature | Motor overheating has been detected by frequency converter motor temperature model. Motor is overloaded. | Decrease the motor load.<br>If no motor overload exists, check the temperature model parameters. |
| 17 | Motor underload | Motor underload protection has tripped. | |
| 22<br>23 | EEPROM checksum fault | - parameter save fault<br>- faulty operation<br>- component failure | |
| 24 | Changed data warning | Changes may have occurred in the different counter data due to mains interruption | |
| 25 | Microprocessor watchdog fault | - faulty operation<br>- component failure | Reset the fault and restart.<br>Should the fault re-occur, contact the distributor near to you. |
| 29 | Thermistor fault | Thermistor is broken. | Reset the fault and restart.<br>Should the fault re-occur, contact the distributor near to you. |
| 32 | Fan cooling | Cooling fan of the frequency converter does not start, when ON command is given | Contact the distributor near to you. |
| 34 | CAN bus communication | Sent message not acknowledged. | Ensure that there is another device on the bus with the same configuration. |
| 36 | Control unit | NXS Control Unit can not control NXP Power Unit and vice versa | Change the control unit. |
| 37 | Device change | Option board changed.<br>Different power rating of drive. | Reset<br>**Note:** No fault time data record! |
| 38 | Device added | Option board added.<br>Drive of different power rating added. | Reset<br>**Note:** No fault time data record! |
| 39 | Device removed | Option board removed.<br>Drive removed. | Reset<br>**Note:** No fault time data record! |
| 40 | Device unknown | Unknown option board or drive. | Contact the distributor near to you. |

| | | | |
|---|---|---|---|
| 41 | IGBT temperature | IGBT Inverter Bridge overtemperature protection has detected too high a short term overload current | Check loading.<br>Check motor size. |
| 42 | Brake resistor overtempera-ture | Too powerful braking. | Set the deceleration time longer.<br>Use external brake resistor. |
| 43 | Encoder fault | Note the exceptional Fault data record. Additional codes:<br>1 = Encoder 1 channel A is missing<br>2 = Encoder 1 channel B is missing<br>3 = Both encoder 1 channels are missing<br>4 = Encoder reversed | Check encoder channel connections.<br>Check the encoder board. |
| 50 | Analogue input $I_{in}$ < 4mA (selected signal range 4 to 20 mA) | Current at the analogue input is < 4mA.<br>- control cable is broken or loose<br>- signal source has failed | Check the current loop circuitry. |
| 51 | External fault | Digital input fault. | |
| 52 | Keypad communication fault | The connection between the control keypad and the frequency converter is broken. | Check keypad connection and possible keypad cable. |
| 53 | Fieldbus communication fault | The connection from the fieldbus to the frequency converter is broken. | Check installation.<br>If installation is correct contact the nearest Vacon distributor. |
| 54 | SPI communi-cation fault | The connection between the component board and the control board is broken. | Check board and slot.<br>Contact the nearest Vacon distributor. |
| 55 | New calibration | Positioning area override | Make new calibration |

*Table 7- 1. Fault codes*

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